At Behring's and the Pribyloff Islands the fur seals are reported to make their appearance from the southward late in spring, and that they only resort to these islands for the purposes of reproduction, and leave them early in the autumn. Their haunts at other seasons seem not to be well known, but it is evident that their winter quarters must be to the southward of these islands. That there is a southward migration of these animals in winter is evident from their reported greater frequency at that season on the Pacific coast of the United States.

Habits. — The very full account of the habits of this species, contained in the following communication of Captain Bryant, together with the accompanying notes, require nothing to be added on this point in the present connection.

II.

On the Habits of the Northern Fur Seal (Callorhinus ursinus *Gray*), *with a Description of the Pribyloff Group of Islands.* *By* Captain Charles Bryant, *with Notes by* J. A. Allen.

Description of the Pribyloff Group of Islands.

Discovery. — The group of several small islands, known as the Pribyloff Group, were discovered under the following circumstances. Captain Pribyloff, who in 1781 took charge of the Russian trading factory at Ounalaska, observed during his voyages among the islands to the westward of Ounalaska numbers of fur seals going north in spring and returning in autumn. Believing that there must be unknown land to the northward to which these animals resorted, he fitted out an expedition for the purpose of discovering it, and in June, 1785, while cruising for that purpose, discovered an island. He took possession of this island, colonized it, and called it St. George's, from the vessel in which the discovery was made. On a clear day, during the following year, these colonists saw another island to the northward of the first, and visiting it in their canoes, proceeded to occupy it. The island was called St. Paul's, from its discovery being made on St. Paul's day.

St. Paul's Island. — St. Paul's Island, of which I append an outline sketch (Fig. 5) is nearly triangular, and sixteen miles in length. Its northern side is a little concave. Its greatest breadth is four miles, at

Fig. 5.

Diagram of St. Paul's Island: *a*, harbor and native village; *b*, sea-lion rookery

a point one third its length from the west end. From this point a narrow peninsula, half a mile wide and two and a half miles long, extends in a southwest direction from the main island. The island is of volcanic origin, and consists of a cluster of flattened cones. The central cones of the island have an elevation of from two to three hundred feet, and a diameter of from half a mile to one mile and a half. Those on the outside, which form the shore line, are much smaller, they being only from one eighth to half a mile in diameter, and from fifty to sixty feet in height. Their bases touch those of the central higher cones. Between the chains of cones are narrow valleys, raised but little above the sea level. The border cones are composed entirely of clinkstone, and their surfaces appear to have undergone no change other than that resulting from the original fissuring, and the subsequent action of frost. Where these cones extend into the water they form rounded points with gently sloping shores. There is a belt of loose rocks, varying from five to forty rods in width, between the base of the outer cones and the water. The coves formed between these points have shores of loose lava sand.

The peninsula is formed by two of these cones, one of which is one half and the other two and a half miles distant from the main island, with which they have been recently connected by the deposition of loose sand thrown up by the action of the waves. The connecting

necks of land thus formed have a height of only six or eight feet above the tide level.

The cones of the peninsula differ from those of the main island in being elongated instead of circular, and in having their surfaces covered with a layer of pitchstones, several inches in thickness, above the clinkstones.

On the cone in the centre of the peninsula there is a bed of volcanic ashes and cinders, which shows by its loose mixed condition that it fell there after the elevation and cooling of the rock above water. Opposite the junction of the peninsula with the main island is a cliff, facing the southeast, sixty feet high. Its composition of alternate layers of cinders and ashes indicates that it was deposited under water, and subsequently elevated to its present position. This cliff has been worn into by the waves, and portions of it continually falling down furnish material for the increase of the sand belt, along the southeast shore of the island. A seam or stratum two feet in thickness, composed mainly of volcanic ashes, and containing lumps of calcined sea mud and petrified shells, extends the whole length of the cliff, parallel with its surface curves, and situated at about midway its height. These shells differ from any now found on the island.

The distance from the point where the peninsula joins the island to the west end of the island is about eight miles, and the general trend of the shore is northwest. The peninsula itself extends two miles and a half in a southwesterly direction, with a reef continuing to the westward a mile farther. Within the angle formed by these two shores is an open harbor, with anchorage of from nine to thirteen fathoms of water, half a mile to three miles off shore.

A vessel lying here is sheltered from winds blowing from any northerly point between northwest and east; with the wind more to the southward, a heavy swell rolls over the reef, making it very rough. At the head of the cove is located the trading-post of the former Russian company and the native village. This portion of the island is undergoing great changes, from the filling in of sand from deep water. At no very remote period there existed a spacious harbor within the cove now filled with sand; and there are people living on the island who remember when the peninsula itself was an island. In this cove last year a vessel drawing six feet of water lay and swung at her anchor where it is now dry at low tide. The sand is brought up by the action of

the tides from deep water, and being thrown on the shores soon becomes dry and light, and is blown by the high winds into the valleys and over the slopes of the hills, filling up the cracks in the rocks. The climate being moist, the soil thus thrown up is rapidly overspread with a luxuriant growth of grass, conspicuous among which is the redtop and other common grasses of the New England States; at a lower level on the made land a grass grows which, when young, resembles oats, but later it heads out like rye, and bears a small black seed which resembles the latter grain when shrunken in ripening. These grass-heads in winter furnish rich forage for the cattle and other stock living on the island. Among the profusion of wild flowers are the dandelion, buttercup, wild pea and bean, yarrow, wormwood, and other weeds; also the cow-parsnip or wild celery. The latter the natives consider a great luxury, they eating the seed stalks when green and tender with great relish.

The northeast point of the island is formed by a cone two miles in diameter and a hundred feet in height. It was once two and a half miles distant from the main island, but is now connected with it. The action of the tide ebbing and flowing has formed bars of sand on the two outer sides; they thus have extended until they have united the two islands, enclosing between them a long narrow lake. This lake is now rapidly filling with sand, and being only a mile long it has become quite fresh by the annual melting of snow in it.

The southeast shore of the island has also a belt of sand, which is in many places half a mile wide, and is constantly increasing. In many places the sand is drifted to the height of fifty feet, which shows that at some period of the year the island is subject to very high winds.

On one of the largest cones near the centre of the island is the rim of an extinct volcano, with a crater thirty rods in diameter. This rises to a height of two hundred feet above the surrounding plain of clinkstones. Its walls are of red tufa, much crumbled and broken, the *débris* of which fills the opening in the centre.

Around its base are several fissures communicating with dark caves. Three fourths of a mile west is a still larger crater, but of less elevation. The surface of this portion of the island is covered with broken clinkstones, and is either entirely bare of vegetation or only covered with moss.

Otter Island. — Four miles southwest, and in line with the peninsula, is a small rocky island, half a mile in its longest diameter, one fourth of

a mile wide, and about forty feet high, with a sloping shore on one side. It is a part of a cone which has been broken off on three sides, and the other part submerged. This is called Otter Island, and has on it a small fur seal rookery, yielding three thousand skins annually.

Mosrovia, or Walrus Island. — East-southeast from the east end of St. Paul's Island, eight miles distant, is a rock rising on all sides to a height of thirty-five feet, half a mile long by one eighth wide. It has around its base at the water line several ledges or shelves, on which the walruses come to lie after feeding on the banks east of the island. These animals frequent the island during the summer in large numbers, and are killed by the natives for their ivory. On the island is also a small sea lion rookery. It is also the breeding-place of immense flocks of sea-fowl, and the natives of St. Paul hence visit it in the laying season for the purpose of obtaining eggs.

St. George's Island. — This island lies forty miles to the southeast of St. Paul's, and is nearly triangular in form (Fig. 6); its greatest

Fig. 6.

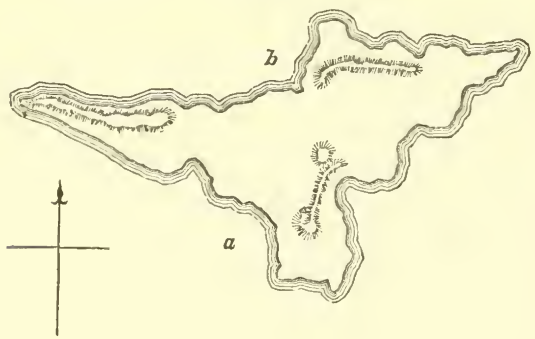

Diagram of St. George's Island: *a*, principal seal rookery; *b*, harbor and settlement.

length is twelve miles in an east and west direction. The greatest width of the island, which is near its centre, is four miles. Its northern shore has an indentation near its centre of three fourths of a mile in depth, with a bank in front. Within this cove vessels may anchor in ten fathoms of water, one half a mile off shore. It is at this point that the settlement is situated. The southeast and southwest sides are very irregular, with indentations on each side where vessels may anchor in from ten to sixteen fathoms, one fourth of a mile from

shore, but with poor holding-ground, and no shelter except when the wind is from the land.

This island is of similar origin to St. Paul's, but differs from it in outline. A mountain ridge nearly one thousand feet high traverses the southeast part of the island parallel to the shore, and forms a perpendicular sea front, from two to six hundred feet high. West of the ridge the island is intersected by a valley three miles wide, descending gradually on either side to the shores, where it terminates in low broken cliffs. To the westward of the valley the surface rises again rapidly, and ends in a narrow perpendicular headland six or seven hundred feet high.

The whole appearance of the island indicates that it was originally much larger than it is at present, and that the outer portion has been broken off and submerged, leaving the sides perpendicular. It is only on the sloping shores near the middle of the island that the seals can obtain a footing. On all the other sides the surf breaks against the base of the cliffs. Broken clinkstones cover most of the surface of the island, upon the lower parts of which a thin soil of decayed vegetable matter has accumulated. Owing to the springy, oozy nature of the ground, the houses are all built above-ground, and not partially below the surface as on St. Paul's. The island has one hundred and sixty Aleutian inhabitants, similar to those of St. Paul's.

The island of St. George is estimated to yield one half as many seals as St. Paul's, but owing to the poor anchorage and the difficulty of loading the vessels with the skins, the seals have been less disturbed.

The Climate.—No record of the temperature at these islands had been kept previous to my arrival. My observations at St. Paul's give the mean temperature of June as 48° F.; of July, 51°; a part of August, 60° These are the three warmest months of the year. I was told that the mercury froze twice during the previous winter.

Snow falls on these islands from October to April, but except in sheltered spots it does not attain any great depth, blowing off as fast as it falls.

From the middle of March to the latter part of May the great body of floating ice comes down from the north, and passes by the east end of the island to the southwest. At this time the weather is very severe, this being the most stormy period of the year. This body of ice seldom extends as far south as St. George's, forty miles distant. During my

residence at St. Paul's there was very little fog on the island, though it could be seen resting on the water ten or fifteen miles off shore, forming clouds which obscured the sun during the greater part of the time. The climate is not favorable to agriculture, but there is at least a thousand acres of first-class grazing land along the southeast shore and in the vicinity of the village.

Last year a horse and four neat cattle were brought to the island. Directions had been given to prepare hay for them, but owing to the dampness of the atmosphere it was not done, so that when the cattle were landed there were only such supplies of food for them as the island naturally afforded. They therefore had to subsist on the dry grass of the flats, on which they wintered in good condition, the cows giving a good supply of milk. The wild rye-heads proved nutritious food, of which the supply was abundant. The horse also came through in excellent condition, though having no grain. Goats and sheep have been added to the stock on the island during the past season. They have all bred and are doing well. I have been thus minute in these details, because I have often heard it asserted that these islands are barren rocks, without vegetation.

The Habits of the Fur Seal.

The fur seals resort to the Pribyloff Islands during the summer months for the sole purpose of reproduction. Those sharing in these duties necessarily remain on or near the shore until the young are able to take to the water. During this considerable period the old seals are not known to take any food. In order to speak intelligibly of the duties of the several classes of seals at this important season, it is necessary at this point to describe the animals.

The male fur seal does not attain mature size until about the sixth year. He then measures in total length from seven to eight feet, and six to seven in girth. His color is then dark brown, with gray overhair on the neck and shoulders. When in full flesh his weight varies from five to seven hundred pounds. These and no others occupy the rookeries (or breeding-grounds) with the females.

A full-grown female measures four feet in length and two and a half around the body, and differs from the male in form by having a somewhat longer head, shorter neck, and a greater fulness of body posteriorly. She usually weighs from eighty to a hundred pounds. Her

color when she first leaves the water is a dark steel-mixed on the back, the sides and breast being white; but she gradually changes somewhat, and in eight or ten days after landing becomes dark brown on the back, and bright orange on the breast, sides, and throat. Hence it is easy to distinguish those that have just arrived from those that have been several days on the shore. The female breeds the third year, and is full-grown at four years.

The yearlings weigh from forty to fifty pounds, and are dark brown with a lighter shade on the throat and breast. The ages of those between one and six years old are easily distinguished by the differences in size and state of development of the animals. The reproductive organs of the male are fully developed the fourth year, and it is mainly by males of this age that the fertilization of the females is effected. Copulation, described more fully later, usually takes place in the water.

The breeding-rookeries, which are frequented exclusively by the old males and females with their pups, occupy the belt of loose rocks along the shores between the high-water line and the base of the cliffs or uplands, and vary in width from five to forty rods. The sand beaches are used only as temporary resting-places, and for play-grounds by the younger seals; these beaches being neutral ground, where the old and infirm or the wounded may lay undisturbed.

The old male appears to return each year to the same rock so long as he is able to maintain his position. The native chiefs affirm that one seal, known by his having lost one of his flippers, came seventeen successive years to the same rock.*

Those under six years are never allowed by the old ones on these places. They usually swim in the water along shore all day, and at night go on the upland above the rookeries and spread themselves out, like flocks of sheep, to rest.

* Dr. Newberry states (United States Pacific Railroad Surveys and Explorations, Vol. VI, Zoology, p. 50, 1857) that Dr. William O. Ayres of San Francisco presented a skull of a "sea lion" to the California Academy of Science, obtained by him during a visit to the Farallone Islands in June, 1855, concerning which he made the following remarks, which tend to corroborate Captain Bryant's opinion that the seals return year after year to the same breeding-grounds. Dr. Ayres observes: "The specimen is of interest as illustrating, in one particular, the habits of these animals. The left zygomatic arch has been perforated by a bullet, and the lower part of the left inferior maxillary bone by another; both these injuries having been received so long since that the action

Wherever a long continuous shore line is occupied as a breeding-rookery, neutral passages are set apart at convenient distances through which the younger seals may pass from the water to the upland and return unmolested. Often a continuous line moving in single file may be seen for hours together going from the water to the upland, or the reverse, as the case may be. When suddenly disturbed while sleeping on the upland by an attempt of an animal to cross the rookery at any other place, a general engagement ensues, which often results in the death or serious crippling of the combatants. After the females have arrived at the rookeries, many of them, as well as their pups, are trampled to death in these struggles.

Constant care is also necessary lest thoughtless persons incautiously approach the breeding-grounds, as the stampede of the seals that would result therefrom always destroys many of the young.

The old males are denominated by the natives *Seacutch* (married seals). These welcome the females on their arrival, and watch over and protect them and their young until the latter are large enough to be left to the care of their mothers and the younger males.

Those under six years old are not able to maintain a place on the rookery, or to keep a harem, and these are denominated *Holluschuck* (bachelors). These two classes of males, with the full-grown females, termed *Motku* (mothers), form the three classes that participate in the duties of reproduction.

By the first to the middle of April the snow has melted from the shore and the drift ice from the north has all passed. Soon after this period, a few old veteran male seals make their appearance in the water near the island, and after two or three days' reconnoissance venture on to the shore and examine the rookeries, carefully smelling them. If the examination is satisfactory, after a day or two a few climb the slopes and lay with their heads erect listening. At this time, if the wind blows from the village towards the rookeries, all fires are extinguished and

of the absorbents has almost smoothed the splintered edges of the bones. Inside of the wound of the zygoma was found the piece of lead which had caused it, and which was at once recognized, from certain peculiarities of form, as one which had been fired, without fatal effect, at a sea lion, on the same rocks, in the summer of 1854. We have thus a demonstration," Dr Ayres continues, "that these huge seals return, in some instances at least, year after year, to the same localities. They leave the Farallones in November and return in May, being absent about six months. How far they migrate during that interval we have at present no means of determining." — J. A. A.

all unnecessary noises avoided. These scouts then depart and in a few days after small numbers of male seals of all ages begin to arrive. The old patriarchs soon take their places on the rookeries and prevent the younger males from landing. They thus compel them to either stay in the water or go to the upland above.

In locating, each old male reserves a little more than a square rod of space to himself. For this proceeding they evidently have two reasons. First, from the constant liability to surprise from their rear, which is their weakest point, they require room enough to make one leap in turning before being able to defend themselves or to attack their enemies. Their eyes being adapted to seeing in the water, their vision is feeble when they are out of that element. Consequently they have to rely mainly on the senses of hearing and smell for warning of danger; hence while dozing on the rocks every movement or sound in their vicinity keeps them constantly turning towards the direction from which it proceeds. A second reason is that each requires that amount of space for the reception of his ten or fifteen wives.*

Male seals continue to arrive in small numbers daily, a few of which are yearlings; those two, three, four, and five years old arrive in about equal proportions. Those older than this are more numerous than the younger, each one of which fights his way to his old place on the rookery,† or, taking a new one, prepares to contend for it in case the owner comes to take it. As they acknowledge no right but that of might, the later comer has to select again. The growling and fighting are constant, so that day and night the aggregated sound is like that of an approaching railway train.

About the 15th of June the males have all assembled, the ground being then fully occupied by them, as they lay waiting for the females to come. These appear in small numbers at first, but increase as the season advances till the middle of July, when the rookeries are all full, the females often overlapping each other.

* Steller gives the number of females to each male as eight to fifteen or even fifty. ("Mares polygami sunt, unus sæpi 8, 15, ad 50 fœmellas habet, quas anxie æmulabundus custodit, et vel alio tantillium appropinquante, in furorem agitur.") Several of the earless seals, as well as all the species of eared seals, are well known to be polygamous. The seraglios of the male sea elephant, whose habits are better known than those of any other of the group, are said to embrace frequently from fifteen to twenty females. — J. A. A.

† Steller remarks that the males sometimes become so attached to their stations that they prefer death to the loss of them. — J. A. A.

Many of the females on their arrival appear desirous of returning to some particular male, and frequently climb the outlying rocks to overlook the rookeries, calling out and listening as if for a familiar voice. Then changing to another place they do the same again, until some "bachelor" seal swimming in the water approaches and drives her on shore, often compelling her to land against her will. Here comes in the duty of the "bachelor" seals. They swim all day along the shore escorting and driving the females on to the rocks as fast as they arrive. As soon as a female reaches the shore, the nearest male goes down to meet her, making meanwhile a noise like the clucking of a hen to her chickens. He bows to her and coaxes her until he gets between her and the water so that she cannot escape him. Then his manner changes, and with a harsh growl he drives her to a place in his harem. This continues until the lower row of harems is nearly full. Then the males higher up select the time when their more fortunate neighbors are off their guard to steal their wives. This they do by taking them in their mouths and lifting them over the heads of the other females, and carefully placing them in their own harem, carrying them as cats do their kittens. Those still higher up pursue the same method until the whole space is occupied. Frequently a struggle ensues between two males for possession of the same female, and both seizing her at once pull her in two or terribly lacerate her with their teeth. When the space is all filled, the old male walks around complaisantly reviewing his family, scolding those who crowd or disturb the others, and fiercely driving off all intruders. This surveillance always keeps him actively occupied.

In two or three days after landing, the females give birth to one pup each,* weighing about six pounds. It is entirely black, and remains of this color the whole season. The young are quite vigorous, even at birth, nursing very soon after they are born. The mother manifests a strong attachment for her own young, and distinguishes its cry among thousands. The voice of the female is like the bleating of a sheep, and the cry of the pup resembles that of a lamb.†

* A single young at a birth seems to be the general rule in this family; cases where two are produced seeming to be, so far as known, exceptional. The period of gestation is stated by different authors as being nine to twelve months, varying in the differing species, from twelve in the fur seals to nine or ten in the hair seals. — J. A. A.

† By several different writers the voice of the male is compared to the roaring of the lion; that of the female to the bleating of a sheep; and that of the young to the cry of a lamb, not only in the case of the present species, but also of their southern allies.

In a few days after the birth of the young the female is ready for intercourse with the male. She now becomes solicitous of his attentions, and extends herself on the rocks before him. Owing to the position of the genital organs, however, coition on land seems to be not the natural method, and only rarely, perhaps in three cases out of ten, is the attempt to copulate under such circumstances effectual. In the mean time the four and five year old males are in attendance along the shore. When their jealous lord is off his guard, or engaged in driving away a rival, the females slip into the water, when an attentive "bachelor" seal follows her to a distance from shore. Then, breast to breast, they embrace each other, turning alternately for each other to breathe, the act of copulation sometimes continuing from five to eight minutes.*

When the female again returns to the shore she is treated with in-

Kraschennimkow, apparently quoting from Steller, thus quaintly describes their voice as heard under different circumstances. "When this animal lies upon the shore and diverts himself, his lowing is like that of a cow; when he fights he growls like a bear; when he has conquered his enemy he chirps like a cricket." — *Hist. of Kamtsch.*, p. 228. Mr. Dall observes that they have "a kind of piping whistle which they use when tired or hot." — J. A. A.

* Other accounts somewhat vary from this. Steller's remarks on this point are as follows: "Concubitum exercent more hominum ita ut mas incubus fœmella succuba sit, præcipue autem circa vesperam veneris exercitiis inhiant: horam antea tam mas quam fœmella in mare se recipiunt, una placide natant, dein una renertuntur, fœmella supina in dorso jacet, mas vero e mari supernenit, anterioribus pedibus innixus, maximo feruore libidinem exercet, et sub hoc lusu fœmellam ita premit et pondere suo in arenam demergit, ut nihil nisi caput emineat, ipse vero pedibus anterioribus adeo in arenam descendit, ut tandem toto ventre fœmellam premat et contingat. Locum eligunt ipsum litus arenosum, qua undis hunedum alluitur, adeo intenti et obliuiosi sui ipsius sunt, ut plusquam per quadrantem horæ scortanti abstarem, antequam me observaret, nec observasset, nisi manu colapham impegissem, ex quo adeo iratus maximo fremitu me lacessiuit, ut ægre me surriperem, ille vero nihilominus me eminus vidente, quod cœperat, absoluit opus per integrum quadrantem horæ."

Mr. W. H. Dall, in August, 1868, spent some time at St. George's Island, and in some valuable notes on the natural history of this island, which he has kindly placed at my disposal, I find the following remarks, which, it will be seen, are quite confirmatory of Steller's account: "They [the females] sleep in the water, lying on their sides, with the two flippers [of the upper side] out of the water, and receive the male in the same position. They sometimes remain *in copula* for upwards of an hour." While these statements are doubtless quite true, at least in numerous instances, the more favorable opportunities for observation Captain Bryant has had, leave little reason to suppose he has, through any inattention, been deceived in the matter.

I have been thus lengthy in these comments from the fact that this mode of coitus has not been supposed to occur among the lower mammalia. — J. A. A.

difference by all the males. She now roams at will about the rookery, whereas before she was not allowed to go to the relief of her young when in distress and crying for her. By the middle of August the young are all born, and the females are again pregnant. The old males having occupied their stations constantly for four months, without food, now resign their charge to the younger males, and go to some distance from shore to feed.

The fact of their remaining without food seems so contrary to nature, that it seems to me proper to state some of the evidences of it. Having been assured by the natives that such was the fact, I deemed it of sufficient importance to test it by all the means available. Accordingly I took special pains to examine daily a large extent of the rookery and note carefully the results of my observations. The rocks on the rookery are worn smooth and washed clean by the spring tides, and any discharge of excrement could not fail to be detected. I found, in a few instances, where newly arrived seals had made a single discharge of red-colored excrement, but nothing was seen afterwards to show that such discharges were continued, or any evidence that the animals had partaken of food. They never left the rocks, except when compelled by the heat of the sun to seek the water to cool themselves. They are then absent from the land for but a short time. I also examined the stomachs of several hundred young ones, killed by the natives for eating, and always without finding any traces of food in them. The same was true of the few nursing females killed for dissection.* On their arrival in the

* Steller states that, in the numerous specimens he dissected, he always found the stomachs empty, and remarks that they take no food during the several weeks they remain on land. Mr. Dall confirms the same statement in respect to the present species, and Captains Cook, Weddel, and others, who have had opportunities of observing the different southern species, affirm the same fact in respect to the latter. Lord Shuldham long since stated that the walrus had the same habit, though its annual fast seems somewhat shorter than those of the eared seals. In the London Philosophical Transactions for the year 1775 (p. 249), in briefly describing the droves of walruses that at that time frequented the Magdalen and other islands in the Gulf of St. Lawrence, he says that they crawl upon the land in great numbers, at convenient landing-places, "and sometimes remain for fourteen days together without food, when the weather is fair; but on the approach of rain they immediately retreat to the water with great precipitation."

This singular phenomenon of a protracted annual fast during the period of parturition and the nursing of the young — the season when most mammals require the most ample sustenance — seems not wholly confined to the walruses and the eared seals. So far as known, however, it is limited to the Pinnipedes; and, excepting in the case of a single

spring they are very fat and unwieldy, but when they leave, after their four months' fast, they are very thin, being reduced to one half their former weight.

The female has four teats, two on each side, equidistant, and in line between the fore and hind flippers. Their milk is of a yellowish color, composed of water and caseine, very insipid, and containing no sugar. The pups nurse but seldom, and when separated from the mother for thirty-six hours and returned to her again, they seem in no haste to do so, and in some cases did not for several hours afterwards.

About the 20th of July the great body of the previous year's pups arrive and occupy the slopes with the younger class of males, and they continue to be mixed together during the remainder of the season. The two-years-old females, which pair with the young males in the water near the island, also now associate with the other females.

The pups are five weeks old when the old females go off to feed; they go with the mothers to the upland, but keep by themselves. The pups born on the lower edge of the rookery, where the surf breaks over them occasionally, learn to swim early, but the larger portion of them do not take to the water until later, and many have to be forced in by the parent.* Once in, however, they soon love to sport in it. The young are taught to swim by the old males on their return from feeding.

By the last of October the seals begin to leave the islands in small companies, the males going last and by themselves. In November the

member, the sea elephant (*Macrorhinus elephantinus*), to the two above-named families. By some of the old writers the sea elephant was said to feed sparingly, at this time, on the grasses and sea-weeds that grew in the vicinity of its breeding-places, but the weight of the evidence in respect to this point seems to indicate that this species fasts similarly to the eared seals and walruses, during the period it resorts to the land to bring forth its young. Regarding the period of abstinence of the sea elephants and its effect upon the animals, Weddel observes as follows: "The circumstance of these animals living on shore for a period not less than two months, apparently without taking food of any description, may certainly be considered a remarkable phenomenon in natural economy. That they live by absorption is evident; that is, by consuming the substance of their own bodies; because, when they come first on shore they are excessively fat, and when they return to the sea they are very lean" (*Voyage towards the South Pole*, p. 136).

It may be that other species of the earless seals undergo similar fasts, but if so I have as yet seen no record of the fact. — J. A. A.

* A dislike or fear of the water on the part of the young of other species of fur and hair seals has been reported by other observers. — J. A. A.

young seals (as I was informed by the natives, my own observations ending in August) stop to rest a few days on the Aleutian Islands, and at Ounalaska the natives obtain several hundred skins annually.*

* The following remarks, quoted from Captain Weddel's "Voyage towards the South Pole" (p. 137, August, 1827), show how closely the southern fur seal (*Arctocephalus falklandicus*) resembles the northern fur seal in habits and general economy: —

"Nothing in this class of animals [the seals], and more particularly in the fur seal of Shetland, is more astonishing than the disproportion in the size of the male and female. A large grown male, from the tip of the nose to the extremity of the tail, is six feet nine inches, whilst the female is not more than three feet and a half. This class of males is not, however, the most numerous; but being physically the most powerful, they keep possession of the females, to the exclusion of the younger branches; hence, at the time of parturition, the males may be computed to be as one to twenty [females], which shows this to be, perhaps, the most polygamous of large animals.

"They are in their nature completely gregarious; but they flock together and assemble on the coast at different periods and in distinct classes. The males of the largest size go on shore about the middle of November to wait the arrival of the females, which of necessity must soon follow, for the purpose of bringing forth their young. These, in the early part of December, begin to land; and they are no sooner out of the water than they are taken possession of by the males, who have many serious battles with each other in procuring their respective seraglios; and by a peculiar instinct they carefully protect the females under their charge during the whole period of gestation.

"By the end of December, all the female seals have accomplished the purpose of their landing. The time of gestation may be considered twelve months, and they seldom have more than one at a time, which they suckle and rear apparently with great affection. By the middle of February the young are able to take to the water; and after being *taught to swim by the mother*, they abandon them on shore, where they remain till their coats of fur and hair are completed. During the latter end of February, what are called the dog-seals go on shore: these are the young seals of the two preceding years, and such males as, from their want of age and strength, are not allowed to attend the pregnant females. These young seals come on shore for the purpose of renewing their annual coats, which being done by the end of April, they take to the water, and scarcely any are seen on shore again till the end of June, when some young males come up and go off alternately. They continue to do this for six or seven weeks, and the shores are then abandoned till the end of August, when a herd of small, young seals of both sexes come on shore for about five or six weeks; soon after they retire to the water. The large male seals take up their places on shore, as has been before described, which completes the intercourse all classes have with the shore during the whole year.

"The young are at first black; in a few weeks they become gray, and soon after obtain their coat of hair and fur. . . . . I have estimated the female seal to be, in general, at its full growth within four years, but possibly the male seal is much longer, very likely five or six years; and some which I have contrasted with others of the same size could not, from their very old appearance, be less than thirty years."

[For further information in respect to the habits of the Pinnipedes in general, the reader is referred to Dr. Robert Hamilton's "Natural History of the Amphibious Carnivora," etc. (1839), which forms the eighth volume of the Mammalia of Jardine's "Nat-

Manner of Killing the Seals. — It will be recollected that I have described the younger seals as spreading out on the slopes above the rookeries to rest at night. A party of men approach these places armed with clubs of hard wood, and quietly creep between the seals and the shore. When ready the men start up with a shout at a given signal, and drive the seals inland in a body. When at a sufficient distance from the rookery, they halt to screen the flock of as many as possible that are too old for killing, only those that are two and three years old yielding prime skins; the fur of those older is too coarse to be marketable. The screening is done by driving the seals slowly forward in a curve; the older, sullenly holding back, force the more timid forward, when the men opening their ranks let them pass through and return to the shore. The remainder of the flock is then driven to the killing-ground, though still containing many too old to be of value.

It is necessary to drive the flock some distance from the breeding-ground, as the smell of the blood and the carcasses disturbs the seals. Another object is to make the seal carry his own skin to the salt-house, and it is hence sometimes necessary to drive them six or seven miles. The driving has to be conducted with great care, as the violent exertion causes the seals to heat rapidly, and if heated beyond a certain degree the fur is loosened and the skin becomes valueless. In a cool day they may be driven one mile and a half per hour with safety. They travel by lifting themselves from the ground on their fore legs, and hitching their body after them with a kind of sideways, loping gallop. When arrived at the killing-ground a few boys are employed to keep them from straggling, and they are thus left to rest and cool. Then a small number, from seventy to one hundred, are separated from the flock, surrounded and driven on each other, so that they confine themselves by treading on each other's flippers. Those desired for killing are then easily selected and quickly killed by a light blow on the nose from a hard wooden club. When these are killed, those left as unfit are allowed to go to the nearest water, whence they immediately return to the place from which they were driven. This operation is repeated until the whole flock is disposed of, providing there is time to skin and take care of them all before putrefaction

uralist's Library," — an excellent compilation from previous authors. The more important of the recent papers treating of the habits and other characters of the eared seals have already been cited in the historical "Résumé" of the present paper. — J. A. A.]

would begin. The work of skinning is performed by all the men on the island, and every one participating in it is allowed to share in the proceeds.

As the seals are not wholly at rest until the females arrive, great care is necessary in selecting the time and place from which to drive. These points are determined by a head man, who assumes the whole control of this part of the business. In the month of May only the small number required by the natives for food are driven. In June, when the seals are more numerous, they are driven and killed for their skins, although the percentage of prime skins is at this time very small, often not twenty per cent of the whole flock driven. About the middle of July the females go off into the water, and there is a period of general rest among all the seals, during which time the natives desist entirely from killing for from ten to fourteen days. At the close of this period the great body of yearling seals arrive. These, mixing with the younger class of males, spread over the uplands and greatly increase the proportion of prime skins, but also greatly increase the difficulty of killing properly. Up to this time, there having been no females with the seals driven up for killing, it was only necessary to distinguish ages; this the difference in size enables them to do very easily. Now, however, nearly one half are females, and the slight difference between these and the younger males renders it necessary for the head man to see every seal killed, and only a strong interest in the preservation of the stock can insure the proper care. September and October are considered the best months for taking the seals.

Besides the skin, each seal will yield one gallon and a half of oil, and the linings of all the throats are saved and salted as an article of trade to other ports in the Territory, these being used by the natives for making water-proof frocks to wear in their skin canoes when hunting the sea otter or fishing. These parts have no very great commercial value, though they are considered by the natives as indispensable to them.

It will be seen by the foregoing description of the habits of the fur seal, that the conditions necessary for their preservation and increase are very simple. The first is that they be not unnecessarily disturbed during the period of their arrival on the island. Second, that care be taken in killing to kill only males, and to reserve enough of these for breeding purposes. If these precautions are taken, they increase faster

than if left to themselves; for when the number of males is in excess, the continual fighting on the rookeries destroys many of both females and young, which get trampled to death.*

Mode of Curing the Skins. — The skins are all taken to the salt-houses and are salted in kenches or square bins, the skins being spread down flesh side up, and a quantity of loose salt profusely scattered over them. They remain thus packed for thirty or forty days, when they are taken from the bins; the loose salt is removed, and the skins are folded together, the flesh side in, and sprinkled as they are folded with a small quantity of clean salt. They are then ready for shipment, only requiring a small additional quantity of salt whenever removed.

Number of Seals frequenting the Island. — There are at least twelve miles of shore line on the island of St. Paul's occupied by the seals as breeding-grounds, with an average width of fifteen rods. There being about twenty seals to the square rod, gives one million one hundred and fifty-two thousand as the whole number of breeding males and females. Deducting one tenth for males leaves one million thirty-seven thousand and eight hundred breeding females. Allowing one half of the present year's pups to be females, this will add half a million of breeding females to the rookeries of 1872, in addition to those now there, while the young of last year and the year before are also to be added. This estimate does not include the males under six years of age, these not

* The almost total extermination at some points of some of the various seals formerly extensively hunted for their skins or their oil on the islands and coast of Southern South America is well known. Weddel states (in his "Voyage," already cited) that the number of fur seals taken off the Shetland Islands, during the years 1821 and 1822, may be computed at 320,000. "This valuable animal," he adds, "might, by a law similar to that which restrains fishermen in the size of the mesh of their net, have been spared to render annually 100,000 furs for many years to come. This would have followed from not killing the mothers till the young were able to take to the water; and even then only those which appeared to be old, together with a proportion of the males, thereby diminishing their total number, but in slow progression. This system is [1839] practised at the river of Plata. The island of Lobos, in the mouth of that river, contains a quantity of seals, and is farmed by the Governor of Monte Video, under certain restrictions, that the hunters shall not take them but at stated periods, in order to prevent the animals from being exterminated. The system of extermination was practised, however, at Shetland; for whenever a seal reached the beach, of whatever denomination, he was immediately killed and his skin taken, and by this means, at the end of the second year the animals became nearly extinct; the young losing their mothers when only three or four days old, of course all died, which, at the lowest calculation, exceeded 100,000."
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being allowed on the rookeries by the older males, nor the yearlings. If we now add those frequenting St. George's Island, which number half as many, and make a very liberal discount for those that may be destroyed before reaching maturity, the number is still enormous. It will also be seen that the great importance of the seal fishery is not to be calculated from the basis of its present yield, since each year adds to its extent, as with proper care the number can be increased until both islands are fully occupied by these valuable animals.*

Peculiar situation of the Pribyloff Island. — These islands are situated immediately between the northern edge of the great warm oceanic current, — which, passing into Behring's Sea west of the Aleutian Islands and flowing east through Ounimak Straits, enters the Gulf of Alaska at that point, — and the edge of the rotary cold current which flows from the Gulf of Anadir east through Norton Sound, returning westward to this point again. These currents furnish the necessary climatic conditions of a cool uniform temperature and humid atmosphere necessary to these animals, while their position is just far enough south to escape being visited by the polar bears floating on the ice, as is not the case with the island of St. Matthew's, the nearest land on the north. There are no other islands possessing these advantages in an equal degree. Behring's and Copper Islands, further westward, in Russian waters, approach it nearest.

Prices paid for the Skins at the Islands, and their Value in Europe. — The Russian company allowed the natives the value of ten cents per skin. This was the pay they received for the labor of killing, curing the skins, and delivering them alongside the vessel ready for shipment, the company finding salt and magazines in which to salt them.

The parties who took advantage of the interval between the transfer of the Territory and the enacting and enforcement of the law of the 27th of July, 1868, to kill and purchase of the natives, paid twenty-seven cents per skin, and had they been allowed to trade the present

* It may be added that the United States government has already taken measures to prevent an undue decrease of the fur seals of the Pribyloff Islands, in the amendment to the bill for the preservation of the fur-bearing animals of Alaska, which was passed by Congress early in July of the present year, and that private parties have interested themselves in the preservation of the sea lions that frequent portions of the California coast. — J. A. A.

year would have bidden forty cents apiece for them. To this is to be added the cost of salt, buildings, and the expense of the agency on shore. Their market value was at that time five dollars, so that, after a liberal allowance for incidental expenses, the profit must be very large.

Previous to 1866 these skins were worth only three dollars each, but owing to recent improvements in their manufacture they have become fashionable for ladies' wear, and soon after the transfer of the Territory to the United States the price rose to seven dollars. At this time the Russians had one hundred thousand on hand, which were forwarded to London, the only market for seal-skins in the raw state, and the only place where they are dressed. The different parties who sealed on the islands in the summer following the purchase took two hundred thousand, which so overstocked the market that they are now worth only three or four dollars.

The agents of the Russian Fur Company aimed to control this branch of the fur trade in Europe by regulating the supply. To do this they sent orders a year in advance to have such a number killed as in their judgment the market might need, always keeping at the same time one year's supply on hand. At the time of the sale of the Territory the annual yield was estimated at eighty thousand skins. The opinion of the men who have the special care of the seals is that it has reached one hundred thousand, and that the killing yearly of this number will in no way check their increase. As I have elsewhere explained, to kill a proper number of males annually tends to a general increase in the whole number of seals.

Use of the Flesh by the Natives. — The flesh of the seal constitutes the principal food of the inhabitants, they killing from time to time such numbers as are necessary for that purpose. Before the seals leave in autumn a number are killed sufficient for their winter's supply. The carcasses are allowed to freeze, and in this state they keep them until the return of the seals in the spring. The flesh of the yearling seal is somewhat darker than beef; it is juicy and tender, but lacks the sweetness and flavor of beef, and is less firm and nutritious. In highly seasoned dishes it is relished by nearly all who partake of it. The soldiers on the island preferred it to salt rations. A five weeks' old pup roasted is esteemed a great luxury. The sea lion also constitutes a part of the natural food of the natives.

Cambridge, August, 1870.